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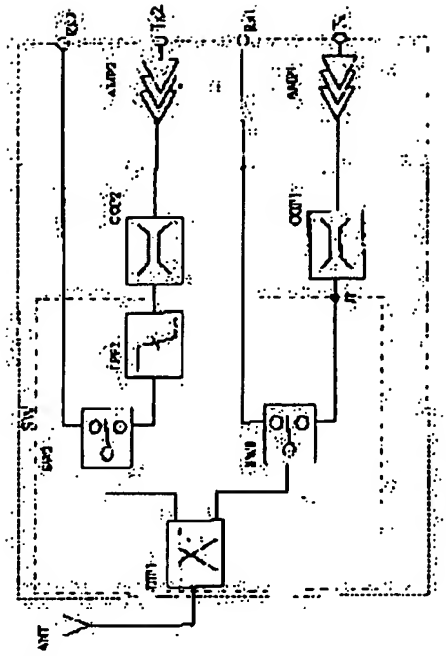
(54) HIGH FREQUENCY TRANSMISSION MODULE



(57)Abstract:

PROBLEM TO BE SOLVED: To provide a high frequency transmission module which integrates an amplifier block with a coupler without deteriorating spurious characteristics.

SOLUTION: The transmission module has amplifiers AMP1, AMP2 for amplifying high frequency input signals and couplers COP1, COP2 for monitoring the outputs of the amplifiers AMP1, AMP2. The amplifiers AMP1, AMP2 are nonconjugately matched with the couplers COP1, COP2 at a spurious frequency n times as high as a fundamental frequency of the high frequency input signal.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram of the transmitting module for high frequency concerning this invention.
[Drawing 2] They are the high frequency switch of drawing 1 , and the circuit diagram of a coupler.
[Drawing 3] It is the circuit diagram of the amplifier of the transmitting module for high frequency of this invention.
[Drawing 4] It is the pattern plot plan of drawing 3 .
[Drawing 5] It is the circuit diagram of an electrical-potential-difference supply track and its near.
[Drawing 6] It is the circuit diagram showing the series resonant circuit of a distributed constant track and a capacitor.
[Drawing 7] It is the circuit diagram showing the series resonant circuit of an inductor and a capacitor.
[Drawing 8] They are some block diagrams of a transceiver system.
[Drawing 9] (a) is a block diagram to show the trouble which happens at the time of adjustment with the conventional amplifier and a coupler, and (b) is the Smith chart Fig.
[Description of Notations]
AMP1, AMP2 ... Amplifier
COP1, COP2 ... Coupler
2a, 2b ... Input matching circuit
3a, 3b ... Semiconductor device for RFs
5a, 5b ... Output matching circuit
6a, 6b ... Electrical-potential-difference supply track
7 10 ... Output side microstrip line track
17a, 17b ... Tip disconnection distributed constant track
L21b ... Distributed constant track
C41b, C41c ... Capacitor
L21c ... Inductor

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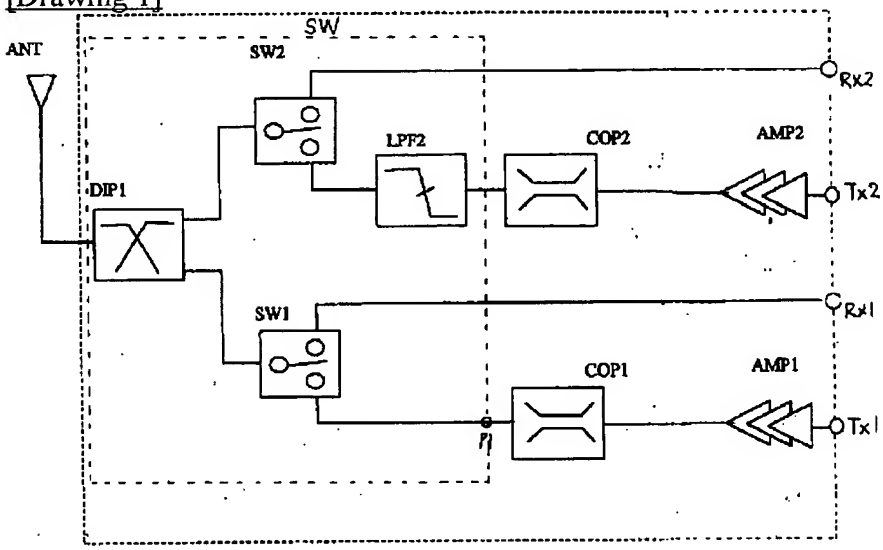
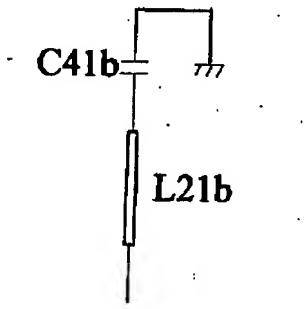
DRAWINGS

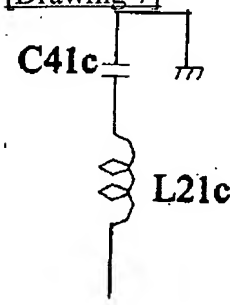
[Drawing 1]



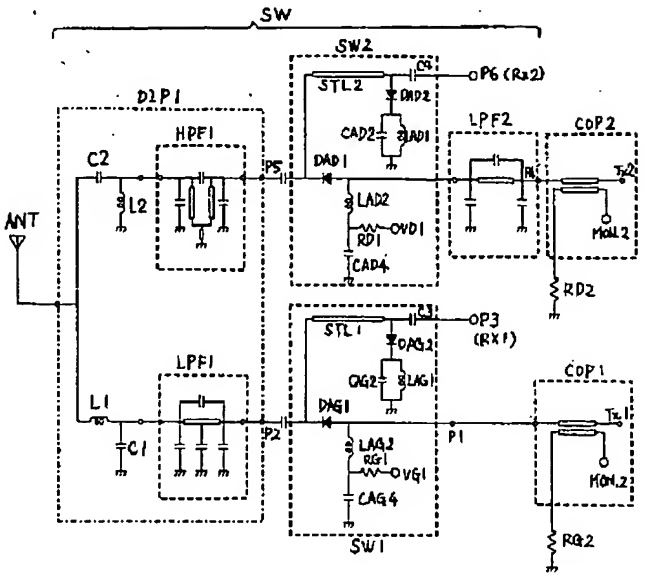
[Drawing 6]



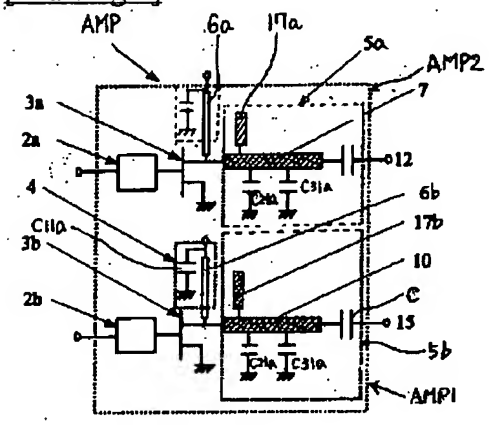
[Drawing 7]



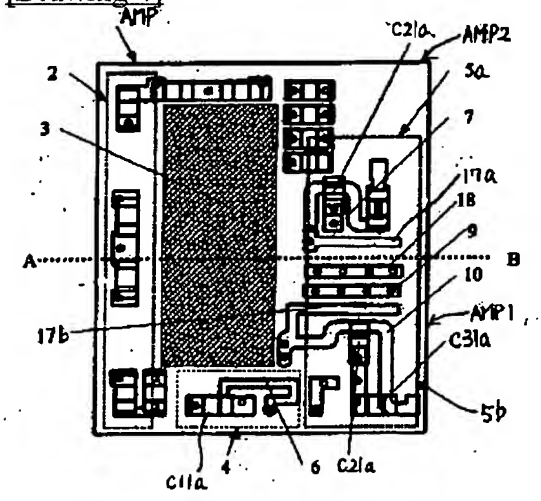
[Drawing 2]



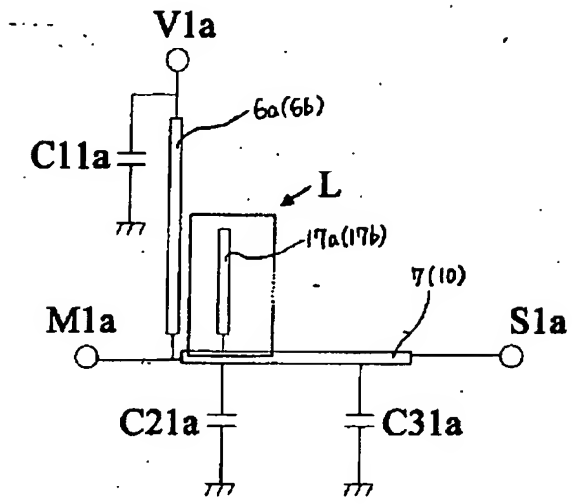
[Drawing 3]



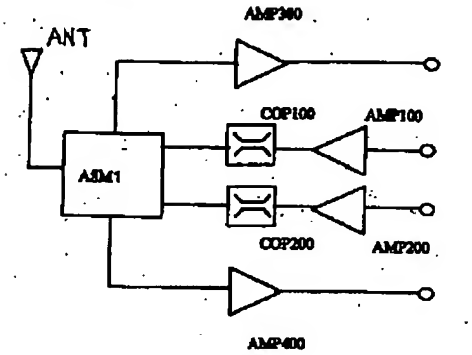
[Drawing 4]



[Drawing 5]

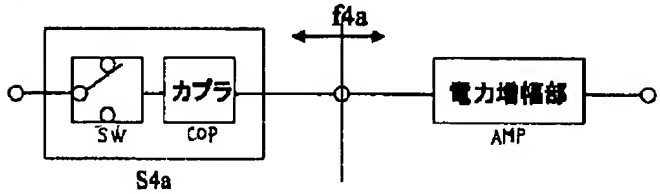


[Drawing 8]

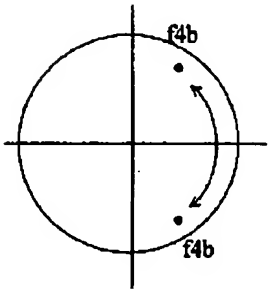


[Drawing 9]

(a)



(b)



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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] Especially this invention relates to the transmitting module for high frequency which has the amplifier which amplifies a high frequency input signal, and a coupler for carrying out the monitor of the output from this amplifier about the transmitting module for high frequency.
[0002]
[Description of the Prior Art] The spread of cellular phones in recent years is astonishing, and function of a cellular phone and improvement in service are achieved. And the proposal of a dual band cellular phone is made as a new cellular phone. This dual band cellular phone deals with two transceiver systems to the usual cellular phone dealing with only one transceiver system. Thereby, a user can choose and use a convenient transceiver system.
[0003] In Europe in recent years, the cellular phone of the dual band method of GSM/DCS which has two or more transceiver systems from which a passband differs is examined.
[0004] The circuit block diagram of a GSM/DCS dual band method is shown in drawing 8 . In the case of the GSM/DCS dual band method shown in drawing 8 , after amplifying with the amplifier AMP100 or AMP200 by the side of Tx at the time of transmission, an electric wave is transmitted from Antenna ANT via the high frequency switch module ASM 1 which consists couplers COP100 or COP200 of through, a high frequency switch, and a branch circuit.
[0005] On the other hand, at the time of reception, it is received from Antenna ANT, and an electric wave takes out through the high frequency switch module ASM 1, and is sent out to the amplifier AMP300 or AMP400 by the side of a receiving circuit (Rx).
[0006] In the cellular phone of the above-mentioned dual band method, if a circuit is constituted using the components COP100 and COP200 of dedication, i.e., couplers, and amplifier AMP100 and AMP200, respectively in each transceiver system, enlargement of a device and high cost-ization will be caused. The part which can be common becomes advantageous [using common components as much as possible] to the miniaturization of a device, and low-cost-izing. Therefore, it is expected in the future that much more miniaturization and lightweight-ization progress, raising a function more.
[0007]
[Problem(s) to be Solved by the Invention] However, in the former, although a part of modularizations which are represented by the high frequency switch module corresponding to a dual band, for example were performed, since the high frequency switch module, the coupler, and each part article of amplifier were mounted in a printed-circuit board, the further miniaturization and lightweight-ization had the problem of being difficult.
[0008] Moreover, since it was necessary to adjust each characteristic impedance of an amplifier, a high frequency switch module, and a coupler, there was constraint at the time of design that a matching circuit is needed for an amplifier, a high frequency switch module, and a coupler, respectively, and there was also a problem of enlarging only the part of the matching circuit.
[0009] Then, in recent years, carrying out the modularization of the coupler which distributes the output power of the power amplifier for RFs and this power amplifier for RFs, the RF switch which separates the transceiver signal of a RF signal spectrally is proposed.
[0010] In the former mounted in a printed-circuit board, the above-mentioned high frequency switch module and the above-mentioned coupler, and each part article of amplifier Since design and commercial production are carried out independently, respectively, in order to reduce fundamental frequency n times the spurious frequency of in a RF input signal, The electrical-potential-difference supply track for impressing an electrical potential difference to the semiconductor device for RFs in the output matching circuit of amplifier, Or generally the track length of the tip

disconnection distributed constant track connected to the output side microstrip line track in an output matching circuit was set as lambda/4 of the fundamental frequency in a RF input signal.
[0011] however, in unifying and carrying out the modularization of an amplifier, a coupler or an amplifier and a coupler, and the high frequency switch Even if spurious reduction is performed in amplifier on an electrical-potential-difference supply track which was described above, or the tip disconnection distributed constant track adjustment by spurious frequency f4a of n times as much arbitration as the fundamental frequency in [in / as shown in drawing 9 (a) / between a coupler and the power amplification sections] a RF input signal -- each coupler and amplifying circuit -- by differing from the case of being independent It may become conjugation adjustment as shown in drawing 9 (b).
[0012] Drawing 9 (b) shows the impedance in the joint when unifying a coupler and an amplifier in a Smith chart Fig., and shows the example in case the impedance by the side of a coupler and the impedance by the side of an amplifier are conjugation adjustment in spurious frequency f4a of n times as much arbitration as fundamental frequency.
[0013] Thus, when the impedance by the side of a coupler and the impedance by the side of an amplifier were carrying out conjugation adjustment, even if it established the spurious reduction circuit in the amplifier, when the transmitting module for high frequency which unified the coupler and the amplifier was formed, there was a problem that the spurious characteristics in spurious frequency f4a of n times as much arbitration as fundamental frequency deteriorated remarkably.
[0014] It aims at offering the transmitting module for high frequency which unified the amplifier and the coupler, without thinking out this invention in view of the above-mentioned situation, and degrading spurious characteristics.
[0015]
[Means for Solving the Problem] The transmitting module for high frequency of this invention is characterized by considering adjustment with said amplifier and said coupler as disconjugation adjustment in fundamental frequency n times the spurious frequency of in a high frequency input signal while it has the amplifier which amplifies a high frequency input signal, and a coupler for carrying out the monitor of the output from this amplifier.
[0016] By such transmitting module for high frequency, even if it unifies and carries out the modularization of an amplifier and the coupler, spurious characteristics cannot deteriorate in the spurious frequency of n times as much arbitration as fundamental frequency, a n times as many spurious component as the fundamental frequency in a high frequency input signal can be controlled effectively, and the transmitting module for high frequency which has spurious characteristics equivalent to the case where a coupler and an amplifier are designed independently can be obtained.
[0017] An amplifier by the transmitting module for high frequency of this invention An input matching circuit, The semiconductor device for RFs and an output matching circuit are provided. All over said output matching circuit It has the output side microstrip line track which sends out a RF signal. It comes to connect the electrical-potential-difference supply track for impressing an electrical potential difference to said semiconductor device for RFs with this output side microstrip line track. It is set up so that adjustment with said amplifier and coupler may turn into disconjugation adjustment in the spurious frequency of a n time wave of fundamental frequency [in / in the track length of this electrical-potential-difference supply track / a RF input signal].
[0018] Thus, do not set the track length of an electrical-potential-difference supply track as lambda/4 of the die length of a fundamental wave like before, but adjustment with an amplifier and a coupler sets it in the spurious frequency of a n time wave of fundamental frequency. Since it specifically set up shorter than one fourth of the wavelength of the fundamental wave in a RF input signal so that it might become disconjugation adjustment, even if it unifies and carries out the modularization of an amplifier and the coupler, the spurious component of a n time wave of the fundamental frequency in a RF input signal can be controlled effectively.
[0019] By the transmitting module for high frequency of this invention, it is set as the output side microstrip line track so that it may come to connect a tip disconnection distributed constant track with an electrical-potential-difference supply track and juxtaposition and adjustment with an amplifier and a coupler may turn into disconjugation adjustment in fundamental frequency n times the spurious frequency of in a high frequency input signal in the track length of said electrical-potential-difference supply track and said tip disconnection distributed constant track.
[0020] Thus, since the track length of not only the track length of an electrical-potential-difference supply track but a tip disconnection distributed constant track was specifically set up shorter than one fourth of the wavelength of the fundamental frequency in a RF input signal so that adjustment with an amplifier and a coupler might turn into disconjugation adjustment in one n times the spurious frequency of fundamental frequency, the spurious component of n of the fundamental frequency in a RF input signal can be controlled still more effectively.
[0021] Moreover, instead of a tip disconnection distributed constant track, a distributed constant track and LC series resonant circuit of a capacitor may be connected to an electrical-potential-difference supply track and juxtaposition on the output side microstrip line track, and in fundamental frequency n times the spurious frequency of in a RF input

signal, the track length of said electrical-potential-difference supply track and said distributed constant track and the capacity of said capacitor may be set up so that adjustment with an amplifier and a coupler may turn into disconjugation adjustment. It has such a transmitting module for high frequency, or the same operation effectiveness as the above, and also after module production, since fine tuning for improving one further n times the spurious characteristics of this is possible, it can satisfy the more nearly optimal spurious characteristics.

[0022] Moreover, instead of a tip disconnection distributed constant track, an inductor and LC series resonant circuit of a capacitor may be connected to an electrical-potential-difference supply track and juxtaposition on the output side microstrip line track, and in fundamental frequency n times the spurious frequency of in a RF input signal, the track length of said electrical-potential-difference supply track, the inductance of said inductor, and the capacity of said capacitor may be set up so that adjustment with an amplifier and a coupler may turn into disconjugation adjustment. Since such a transmitting module for high frequency also has the same operation effectiveness as the above, and can adjust the inductance of an inductor, and the capacity of a capacitor also after module production further and the degree of freedom of adjustment increases it, the more nearly optimal spurious characteristics can be satisfied.

[0023]

[Embodiment of the Invention] The block diagram of the transmitting module for high frequency applied to this invention at drawing 1 is shown. The transmitting module for high frequency Two or more transceiver systems from which a passband differs The high frequency switch SW for multi-bands which has the diode switch circuits SW1 and SW2 which change a transmitting system and a receiving system to the low pass filter LPF 2 and said each transceiver system for removing the branch circuit DIP 1 divided into each transceiver system, and a higher-harmonic signal, In order to carry out the monitor of the output of amplifiers AMP1 and AMP2 and these amplifiers AMP1 and AMP2, it connects with Tx terminal side of the diode switch circuits SW1 and SW2, and consists of couplers COP1 and COP2 corresponding to each passage frequency.

[0024] In addition, the high frequency switch SW is used in order to switch the connection with the branch circuit DIP 1 which is the sending circuit Tx and common circuit corresponding to each system, and connection with the branch circuit DIP 1 which are a receiving circuit Rx and a common circuit in the portable telephone of a GSM/DCS dual band method.

[0025] Moreover, couplers COP1 and COP2 take out a part of sending signal amplified by each amplifiers AMP1 and AMP2, and play the role which sends a feedback signal to an APC circuit.

[0026] The high frequency switch SW of drawing 1 and the concrete configuration of couplers COP1 and COP2 are explained to drawing 2 . The 1st port P1 of the diode switch circuit SW1 connected with the coupler COP 1 by the side of Tx is connected to the anode of diode DAG1. Moreover, the anode of diode DAG1 is grounded through the inductor LAG2 and the capacitor CAG4.

[0027] Furthermore, the node of an inductor LAG2 and a capacitor CAG4 is connected to the control terminal VG 1 through the control resistance RG 1. Moreover, the cathode of diode DAG1 is connected to the 2nd port P2 of a branch circuit DIP 1.

[0028] The end of the transmission line STL 1 is connected to this 2nd port P2, and the other end of this transmission line STL 1 is connected to the 3rd port P3 which is Rx signal output terminal. Moreover, the other end of the transmission line STL 1 is connected to the anode of diode DAG2, and the cathode of diode DAG2 is grounded through the capacitor CAG2 and the inductor LAG1. The parallel resonant circuit formed by the capacitor CAG2 and the inductor LAG1 here is bearing the role which controls the isolation between the 1st port P1 and the 3rd port P3.

[0029] The Tx side coupler COP 2 is similarly connected to the 4th port P4 of the low pass filter LPF 2 for removing a higher-harmonic signal. Moreover, the other end of a low pass filter LPF 2 is connected to the anode of the diode DAD 1 of the diode switch circuit SW2.

[0030] Moreover, the anode of diode DAD 1 is grounded through the inductor LAD2 and the capacitor CAD 4. Furthermore, the node of an inductor LAD2 and a capacitor CAD 4 is connected to the control terminal VD1 through the control resistance RD 1. Moreover, the cathode of diode DAD 1 is connected to the 5th port P5 of a branch circuit DIP 1.

[0031] Furthermore, the end of the transmission line STL 2 is connected to the 5th port P5, and the other end of this transmission line STL 2 is connected to the 6th port P6 which is Rx signal output terminal. Moreover, the other end of the transmission line STL 2 is connected to the anode of diode DAD 2, and the cathode of diode DAD 2 is grounded through the capacitor CAD 2 and the inductor LAD1. The parallel resonant circuit formed by the capacitor CAD 2 and the inductor LAD1 here is bearing the role which controls the isolation between a port P4 and a port P6.

[0032] Moreover, the antenna terminal ANT is connected to the 2nd port P2 and the 5th port P5 through the branch circuit DIP 1, respectively. This branch circuit DIP 1 has the role which separates the frequency of two different

systems, for example, the transceiver signal of a 900MHz band and the transceiver signal of a 1800MHz band.
[0033] The branch circuit DIP 1 is formed here of the high-pass filter HPF 1 and capacitor C2 which pass a 1800MHz band, the inductor L2, the low pass filter LPF 1 and capacitor C1 which pass a 900MHz band, and the inductor L1.
[0034] And some of a branch circuit DIP 1, diode switch circuits SW1 and SW2, low pass filters LPF 2, and couplers [at least] COP1 and COP2 are built in the substrate. For example, the transmission lines STL1 and STL2 which constitute the low pass filter LPF 2 and diode switch circuit for removing the high-pass filter HPF 1 which constitutes a branch circuit DIP 1, a low pass filter LPF 1, and a higher harmonic wave, and couplers COP1 and COP2 are built in the substrate which comes to carry out the laminating of an electrode pattern and the dielectric layer. Moreover, chip type elements which constitute some of a branch circuit DIP 1, diode switch circuits SW1 and SW2, low pass filters LPF 2, and couplers COP1 and COP2, such as diode, are mounted on the substrate.
[0035] The circuit diagram of the amplifiers AMP1 and AMP2 of drawing 1 is shown in drawing 3 , and the concrete configuration of drawing 3 is shown in drawing 4 .
[0036] For example, in the dual method of GSM/DCS which is a European cellular-phone system, one side is [another side] the RF power amplification section AMP 2 for DCS in the RF power amplification section AMP 1 for GSM, these are compounded and Amplifier AMP is constituted.
[0037] Amplifier AMP The semiconductor devices 3a and 3b for RFs (it may be hereafter called MMIC for RFs), Input matching circuit 2a for taking input-impedance adjustment of the RF input signal connected to these MMIC(s) 3a and 3b for RFs, and 2b, The output matching circuits 5a and 5b for taking adjustment to desired output characteristics connected to the electrical-potential-difference supply track 6 which supplies an electrical potential difference to MMIC(s) 3a and 3b for RFs are provided.
[0038] Input matching circuit 2a and 2b have the capacitor, the inductor, etc.
[0039] On the other hand, the output matching circuits 5a and 5b have the output side microstrip line tracks 7 and 10 which send out a different signal, and output side blocking capacitor C is connected among these output side microstrip line tracks 7 and 10 and output terminals 12 and 15. Output terminals 12 and 15 will be connected to drawing 1 and Tx terminal of drawing 2 .
[0040] the output side microstrip line tracks 7 and 10 are independent about the output characteristics, for example, output power, the consumed electric current, etc., of the optimal request of impedance matching with the external circuit connected to output terminals 12 and 15 as a thing etc. -- it is -- as satisfied with coincidence, it is for taking adjustment, and these output side microstrip line tracks 7 and 10 are grounded through capacitor C21for output adjustment a, and C31a.
[0041] Furthermore, in the output side microstrip line tracks 7 and 10, the electrical-potential-difference supply tracks 6a and 6b for impressing an electrical potential difference are connected to MMIC(s) 3a and 3b for RFs, and the tip disconnection distributed constant tracks (opening stub) 17a and 17b are connected to the electrical-potential-difference supply tracks 6a and 6b and juxtaposition.
[0042] The amplifier AMP of this invention is formed in the dielectric substrate which has the specific inductive capacity of a predetermined value as two amplifiers AMP1 and AMP2 as specifically shown in drawing 4 . In the dual method of GSM/DCS which is specifically a European cellular-phone system, the A-B Mashita section is the RF power amplification section AMP 1 for GSM, and the upper part between A-B is the RF power amplification section AMP 2 for DCS.
[0043] Amplifier AMP possesses the output matching circuits 5a and 5b, in order to take adjustment to the input matching circuit 2 for taking input-impedance adjustment of a RF input signal connected to MMIC3 (3a, 3b) for RFs, a bias circuit 4, and desired output characteristics. As for the input matching circuit 2, the capacitor, the inductor, etc. are connected.
[0044] in the output matching circuits 5a and 5b, it is independent at MMIC3 for RFs about desired output characteristics, for example, output power, the consumed electric current, etc., etc. -- it is -- in order to take adjustment so that it may be satisfied with coincidence, the output side microstrip line tracks 7 and 10 which are distributed constant tracks are connected, and these output side microstrip line tracks 7 and 10 are grounded through capacitor C21for output adjustment a, and C31a.
[0045] Furthermore, the tip disconnection distributed constant tracks 17a and 17b are connected to the output side microstrip lines 7 and 10.
[0046] In 1800MHz, the frequency of the RF power amplification circuit AMP 2 for DCS of the upper part between A-B hits the twice as many frequency of 900MHz of the RF power amplification circuit AMP 1 for GSM as this. Although there are a higher harmonic by the side of GSM and a possibility that especially 2 double wave may affect the 1800MHz higher-harmonic signal which is a fundamental wave by the side of DCS by interference, in this invention, it

becomes possible to reduce a higher harmonic by establishing the tip disconnection distributed constant tracks 17a and 17b in the output side microstrip line tracks 7 and 10.

[0047] And in the output matching circuits 5a and 5b, between the output side microstrip line track 7 by the side of DCS, and the output side microstrip line track 10 by the side of GSM, the GND track 9 and the GND track 18 are arranged, and it has become the arrangement which reduces the output microstrip line 7 by the side of DCS and GSM, and interference between ten. these GND tracks 9 and 18 are formed in parallel -- having -- **** -- two or more beer halls -- the conductor connects with GND.

[0048] The electrical-potential-difference supply track 6 of drawing 3 and its near are expanded and shown in drawing 5 . In drawing 5 , sign C21a, C31a, and 7(10) are the output side microstrip line tracks of the capacitor for taking adjustment for the output signal from MMIC3 for high frequency in fundamental frequency, and a distributed constant track, respectively. Moreover, sign 6a (6b) is an electrical-potential-difference supply track which is a distributed constant track for performing electrical-potential-difference supply to MMIC3 for RFs, and in order to ground in RF, capacitor C11a is connected to juxtaposition. Moreover, as for a connection terminal with MMIC3 for RFs, and S1a, M1a shows the connection terminal with a power source, as for a connection terminal with a coupler, and V1a.

[0049] Moreover, in order to control harmonic content, such as 2 double wave and a 3 time wave of fundamental frequency, and to perform spurious reduction, the tip disconnection distributed constant tracks 17a and 17b are connected to juxtaposition on the output side microstrip line tracks 7 and 10. Moreover, in order to perform spurious reduction like the tip disconnection distributed constant tracks 17a and 17b, electrical-potential-difference supply track 6a (6b) is also used.

[0050] In the former which connects each component of amplifier with a coupler In order to reduce spurious one of 2 double wave, for example, the die length of tip disconnection distributed constant track 17a (17b) and electrical-potential-difference supply track 6a (6b) It is set as lambda/4 merit of fundamental frequency, and since it will be in a short circuit condition when an output matching circuit side is seen from connection M1a with MMIC3 for RFs in the frequency of 2 double wave, the frequency component of 2 double wave declines.

[0051] However, if the modularization of the amplifier is carried out to a coupler <A To HREF="/Tokujitu/tjitemdrw.ipdl?N0000=237&N0500=1 E_N/;>;>8>><8///&N0001=825&N0552=9&N0553=000011" TARGET="tjitemdrw"> drawing 9 b As shown, even if it may become conjugation adjustment in a coupler and an amplifier in the higher harmonic of arbitration and performs spurious reduction by Amplifier AMP in that case The signal of a frequency component used as conjugation adjustment will pass the power amplification section, and will flow to a coupler and a high frequency switch, and a spurious component will generate it at a coupler and a high frequency switch edge.

[0052] Therefore, the track length of electrical-potential-difference supply track 6a (6b) which is a circuit for higher-harmonic control in drawing 5 , and tip disconnection distributed constant track 17a (17b) is set up, and spurious reduction is made to be made by the transmitting module for high frequency in this invention as the whole transmitting module for high frequency so that it may not become conjugation adjustment between the power amplification section and a coupler in the higher harmonic of arbitration. Namely, what is necessary is not to make the track length of electrical-potential-difference supply track 6a (6b) and tip disconnection distributed constant track 17a (17b) into lambda/4 of fundamental frequency, and the track length of immobilization called lambda/8, and just to adjust track length so that it may not become conjugation adjustment.

[0053] Specifically, it is desirable for the track length of electrical-potential-difference supply track 6a (6b) to be shorter than one fourth of the wavelength of the fundamental wave in a RF input signal. Moreover, also as for the track length of tip disconnection distributed constant track 17a (17b), it is desirable that it is shorter than one fourth of the wavelength of the fundamental wave in a RF input signal.

[0054] The impedance of 2 double wave which having especially made the track length of electrical-potential-difference supply track 6a (6b) shorter than one fourth of the wavelength of the fundamental wave in a RF input signal contributes to a property in the case of the quarter-wave length of a fundamental wave will be in a short circuit condition, and a phase will be fixed. If the impedance (load) of an electrical-potential-difference supply track and a tip disconnection distributed constant track is a sufficiently big value to a fundamental wave even if it makes the track length of an electrical-potential-difference supply track and a tip disconnection distributed constant track shorter than the quarter-wave length of a fundamental wave To the load of the fundamental wave when specifically seeing an output side from MMIC for RFs, if the load of an electrical-potential-difference supply track and a tip disconnection distributed constant track is 10 or more times, it will be thought that these tracks apply to a fundamental wave when visible to the load of infinity. Moreover, since track length is shorter than the quarter-wave length instead of immobilization to the quarter-wave length of a fundamental wave, the phase of a higher harmonic can be adjusted, and

it becomes possible to consider as disconjugation adjustment in the spurious frequency of the arbitration between a coupler and an amplifier.

[0055] Moreover, since the track length of an electrical-potential-difference supply track and a tip disconnection distributed constant track becomes short, the small transmitting module for high frequency can be obtained.

[0056] In addition, the impedance by the side of the power amplification section in drawing 9 (a) and a coupler has the the same absolute value of real part and imaginary part, and means that it is not in the adjustment condition [****] that the signs of imaginary part differ as disconjugation adjustment here. Thus, by the constituted transmitting module for high frequency, if a high frequency input signal is inputted into input matching circuit 2a and 2b, it will be amplified by MMIC(s) 3a and 3b for high frequency, and will be sent out to a coupler and a high frequency switch through the output side microstrip line tracks 7 and 10 of the output matching circuits 5a and 5b.

[0057] By the transmitting module for high frequency constituted as mentioned above, since the track length of an electrical-potential-difference supply track and the track length of a tip disconnection distributed constant track were set up without controlling to lambda/4 of the die length of fundamental frequency like before so that adjustment with an amplifier and a coupler might turn into disconjugation adjustment, even if it unifies and carries out the modularization of an amplifier and the coupler, a modularization is made, without the spurious characteristics in the spurious frequency of n times as much arbitration as fundamental frequency deteriorating.

[0058] In addition, by this invention, although the track length of an electrical-potential-difference supply track and the track length of a tip disconnection distributed constant track were controlled by the above-mentioned example, even if it sets up only the track length of an electrical-potential-difference supply track so that adjustment with an amplifier and a coupler may turn into disconjugation adjustment, the almost same effectiveness as the above can be acquired.

[0059] Moreover, in this invention, instead of tip disconnection distributed constant track 17a (17b) of drawing 5 , as shown in drawing 6 The series resonant circuit of distributed constant track L21b and capacitor C41b is connected to an electrical-potential-difference supply track and juxtaposition on the output side microstrip line track. In fundamental frequency n times the spurious frequency of in a RF input signal in the track length of the electrical-potential-difference supply track 6 and distributed constant track L21b, and the capacity of capacitor C41b, it is set up so that adjustment with an amplifier and a coupler may turn into disconjugation adjustment. It has such a transmitting module for high frequency, or the same operation effectiveness as the above, and also after module production, since fine tuning for improving the spurious characteristics of a wave n times is possible, it can satisfy the more nearly optimal spurious characteristics.

[0060] Moreover, in this invention, instead of tip disconnection distributed constant track 17a (17b) of drawing 5 , as shown in drawing 7 LC series resonant circuit of inductor L21c and capacitor C41c is connected to an electrical-potential-difference supply track and juxtaposition on the output side microstrip line track. It is set up so that adjustment with an amplifier and a coupler may turn into disconjugation adjustment in the spurious frequency of a n time wave of fundamental frequency [in / in the track length of an electrical-potential-difference supply track, the inductance of inductor L21c, and the capacity of capacitor C41c / a RF input signal]. Since such a transmitting module for high frequency also has the same operation effectiveness as the above, and can adjust the inductance of an inductor, and the capacity of a capacitor also after module production and the degree of freedom of adjustment increases it, the more nearly optimal spurious characteristics can be satisfied.

[0061] In addition, various modification is possible if the transmitting module for high frequency of this invention is range which is not limited to these and does not deviate from the summary of this invention. For example, the case where a coupler and an amplifier are unified is sufficient, without unifying a high frequency switch.

[0062]

[Effect of the Invention] While having the amplifier which amplifies a high frequency input signal, and a coupler for carrying out the monitor of the output from this amplifier according to the transmitting module for high frequency of this invention Since adjustment with an amplifier and a coupler is considered as disconjugation adjustment in fundamental frequency n times the spurious frequency of in a RF input signal, Even if it unifies and carries out the modularization of an amplifier and the coupler, a n times as many spurious component as the fundamental frequency in a RF input signal can be controlled effectively, and it can have spurious characteristics equivalent to the time of designing by the coupler and the amplifier independent.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The transmitting module for RFs characterized by considering adjustment with said amplifier and said coupler as disconjugation adjustment in fundamental frequency n times the spurious frequency of in a RF input signal while having the amplifier which amplifies a RF input signal, and a coupler for carrying out the monitor of the output from this amplifier.
[Claim 2] An amplifier possesses an input matching circuit, the semiconductor device for RFs, and an output matching circuit. It has the output side microstrip line track which sends out a RF signal all over said output matching circuit. It comes to connect the electrical-potential-difference supply track for impressing an electrical potential difference to said semiconductor device for RFs with this output side microstrip line track. The transmitting module for RFs according to claim 1 characterized by being set up in fundamental frequency n times the spurious frequency of in a RF input signal in the track length of this electrical-potential-difference supply track so that adjustment with said amplifier and coupler may turn into disconjugation adjustment.
[Claim 3] The transmitting module for RFs according to claim 2 characterized by being set as an output side microstrip line track so that it may come to connect a tip disconnection distributed constant track with an electrical-potential-difference supply track and juxtaposition and adjustment with an amplifier and a coupler may turn into disconjugation adjustment in fundamental frequency n times the spurious frequency of in a RF input signal in the track length of said electrical-potential-difference supply track and said tip disconnection distributed constant track.
[Claim 4] The transmitting module for RFs according to claim 2 characterized by being set as an output side microstrip line track so that it may come to connect with an electrical-potential-difference supply track and juxtaposition LC series resonant circuit which consists of a distributed constant track and a capacitor and adjustment with an amplifier and a coupler may turn into disconjugation adjustment in fundamental frequency n times the spurious frequency of in a RF input signal in the track length of said electrical-potential-difference supply track and said distributed constant track, and the capacity of said capacitor.
[Claim 5] The transmitting module for RFs according to claim 2 characterized by being set as an output side microstrip line track so that it may come to connect with an electrical-potential-difference supply track and juxtaposition LC series resonant circuit which consists of an inductor and a capacitor and adjustment with an amplifier and a coupler may turn into disconjugation adjustment in fundamental frequency n times the spurious frequency of in a RF input signal in the track length of said electrical-potential-difference supply track, the inductance of said inductor, and the capacity of said capacitor.

[Translation done.]